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AUTHOR(S) Gerald T(homas) GARVEY

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Los Alamos Los Alamos National Laboratory
Los Alamos, New Mexico 87545

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MEASURING THE ANTIQUARK DISTRIBUTION FUNCTION IN NUCLEI

G. T. Garvey
Los Alamos National Laboratory, Los Alamos, NM 87545, U.S.A.

The EMC[1] effect has prompted a great deal of speculation on possible nuclear medium effects on hadron structure. This speculation has continued unabated and unresolved from the first publication of the result. Part of the difficulty arises from the limited information available from inclusive deep-inelastic charged lepton scattering. The structure function extracted from such experiments is

$$F_2^{em}(x) = \sum_f e_f^2 (q_f(x) + \bar{q}_f(x)) \tag{1}$$

where f is the quark flavor $(u, d \ldots)$ and $q_f(x)$ is the probability of a quark of type f carrying a fraction x of the total momentum of a nucleus. As such it is insensitive to quark type, coupling only via the charge squared.

As inclusive neutrino reactions[2] are not able to obtain sufficient statistics to provide additional specific information on quark momentum densities several authors[3] have advocated using the Drell-Yan process to supplement our existing knowledge. The Drell-Yan yield determines the following quantity

$$F(x_1, x_2) = \sum_f e_f^2 [q_f(x_1)\bar{q}_f(x_2) + \bar{q}_f(x_1)q(x_2)] \tag{2}$$

where x_1 refers to the incident hadron and x_2 to a target hadron. Using information on the structure function of incident hadron (p, π, k, etc.) one can select specific aspects of the target quark distribution. For example using incident protons and selecting large x_1 ($x_1 > 0.6$) an antiquark distribution function of the target can be measured. Recent theoretical and experimental developments indicate that the Drell-Yan process can be reliably used to measure ratios of quark distribution functions in different nuclei. An approved experiment[4] at FNAL to measure the ratio of antiquark distribution functions in Fe and D at low x_2 ($0.05 < x_2 < 0.3$) will be briefly discussed. Arguments will be presented that show proton energies lower than 45 GeV are not useful in Drell-Yan studies of nuclear effects.

References

1. J. J. Aubert et al., Phys. Lett. 123B (1983) 275.
2. H. Abramowicz et al., Zeit. für Phys. C25 (1984) 29.
3. e.g., R. P. Bickerstaff et al., Phys. Rev. D33 (1986) 3228; E. Berger, Nucl. Phys. B267 (1986) 231.
4. FNAL E-772, Collaboration of Fermi National Accelerator Laboratory, Los Alamos National Laboratory, University of Illinois (Chicago), State University of New York at Stony Brook, University of Texas, and University of Washington.